ANNUAL PROGRESS REPORT OF

THE ALL INDIA CO-ORDINATED HARVEST AND POST HARVEST TECHNOLOGY SCHEME

(ICAR)

1975

AGRICULTURAL ENGINEERING INSTITUTE
UNIVERSITY OF AGRICULTURAL SCIENCES
RAICHUR - 584101
KARNATAKA

P R E F A C E

The report deals with the progress of research work undertaken in the Harvest and Post-Harvest Technology Scheme at Raichur Centre during the year 1974-75. The projects assigned to this centre vide technical programmes of 1972-73 and 1973-74 are based on the recommendations of the past two Annual Workshops.

Eventhough, the scheme was sanctioned by I.C.A.R. from September, 1972, work was started very late at this centre due to non-availability of technical staff, except Entomologist no other staff was appointed on full time basis. Incharge arrangement was made for Research Engineer post from October, 1973 to August, 1975. Even now, some of the positions are still vacant. So, much progress could not be achieved. However, efforts have been made to procure the equipments and instruments from the available finances and as such progress on certain projects will be reported in the next years' report.

It is placed on record, appreciation to the I.C.A.R. for financing the scheme, and thanks are due to all officials concerned, specially to Sri.C.S. Sridharan, Assistant Director General(Agricultural Engineering) and to Sri.T.H.Nirmal, Co-ordinator(HPHT)

for extending the support to the Scheme whenever required.

Our sincere thanks are due to Dr.H.R.Arakeri, Vice-Chancellor, University of Agricultural Sciences, Karnataka and to Dr.K.Ramakrishnan, Dean, University of Agricultural Sciences, for their guidance and encouragement during the course of work reported here.

Thanks are due to Dr.N.P.Patil, Director of Research, University of Agricultural Sciences, for his keen interest in the AICIT Scheme projects, and encouragement to plan and conduct the investigations successfully.

Prof.K.G.Chaturbhujanathaiah, I/c.Principal, Agricultural Engineering Institute and Sri.D.K. Thirumalachar, I/c.Chief Scientific Officer, Regional Research Station, Raichur deserves most sincere thanks for having provided essential facilities and help at every stage of work conducted. My sincere thanks are due to Mr.V.B.Nadagouda, Farm Superintendent, Regional Research Station, Raichur, for his kind help.

Lastly, I would express my sincere thanks and appreciations to all my fellow research and technical personnel for their active participation in the investigations undertaken.

Place: Raichur.
Date: 22.10.1975.
nvs/

K.C.KRISHNAMURTHY
RESEARCH ENGINEER

C O N T E N T S

nvs/

G E N E R A L

1.	Project Title	: Harvest and Post-Harvest Technology Scheme.
2.	Name of the centre	: Raichur.
3.	Name of the Institution:	Agricultural Engineering Institute, University of Agricultural Sciences, Karnataka.
4.	Date of commencement of the scheme:	1.9.1972
5.	Date of expiry of the scheme:	31.3.1979
6.	Total amount sanctioned for 1974-75:	Rs.1,07,172=00
7.	Amount spent during 1974-75 (31.3.75):	Rs.30,868=00
8.	Report period:	1.1.1975 to 31.12.1975.

STAFF POSITION 1975

Name & Designation	Period
1. Mr.S.D.Shashidhara, I/c.Research Engineer.	From 25.10.1973 To 7.8.1975
2. Mr.K.C.Krishnamurthy, Research Engineer.	From 8.8.1975 To-date.
3. Mr.H.P.Prabhuswamy, Entomologist.	From 4.6.1973 To-date.
4. Mr.D.Keshavamurthy, Research Assistant.	From 21.10.1974 To- date
5. Mr.B.V.Ramakrishna, Research Assistant.	From 31.10.1974 To 4.9.1975.
6. Mr.K.Thippanna, Mechanic.	From 6.2.1975 To-date.
7. Mr.D.~~Jayati~~rtha, Typist.	From 16.12.1974 To-date.
8. Mr.D.Ramaiah, Attender.	From 28.6.1975 To-date.

nvs/

SANCTIONED BUDGET OF THE SCHEME

Sl. No.	Sub-Head	Financial years 1974-75	1975-76
A.	PAY AND ALLOWANCES		
	1. Pay of Offiders	Rs.22,800/=	24,840/=
	2. Pay of Establishment	Rs.17,100/=	17,880/=
	3. Allowances	Rs.19,950/=	21,360/=
	Total	Rs.59,880/=	64,080/=
	Provision for increase in pay and allowances @ 20%.	Rs.11,970/=	12,870/=
	Total A	Rs.71,820/=	76,897/=
B.	RECURRING		
	1. Office contingencies	Rs. 1,000/=	1,000/=
	2. Experimental contingencies.	Rs. 7,500/=	7,500/=
	3. T.A.	Rs. 2,000/=	2,000/=
	Total B	Rs.10,500/=	10,500/=
C.	NON-RECURRING	Rs.19,120/=	19,775/=
	GRAND TOTAL (A+B+C) :	Rs. 1,01,440/=	1,07,172/=

nvs/

PROJECT NO.1 I.C.A.R.CODE NO.$T_2/72$.

Title: COMPARATIVE STUDIES OF VARIOUS FUELS, ELECTRICITY, SOLAR ENERGY AND AGRICULTURAL WASTE FOR DRYING GRAIN.

Studies on different type of dryers with different type of energy are in progress at Hebbal Campus, Bangalore, and Dharwar Campus of University of Agricultural Sciences. Since more work has been done at these centres on the above title, information can be obtained from the Head of the Department of Agricultural Engineering, University of Agricultural Sciences, Hebbal, Bangalore.

As far as Raichur and other adjoining districts are concerned, there are no drying problems for any crop, either in Rabi or Kharif season, because of very hot climate throughout the year.

needed. Recent investigations have shown that, in too delayed harvest, 10 to 20% grain loss occur in the field due to crop lodging, rat and birds damages. Harvesting the crop immediately after physiological maturity is being advocated, which helps to reduce the field losses and enables the farmer to advance the subsequent crop in the same field.

The best time for harvesting sorghum appears to be the moisture content of about 15 to 20% which is to be ~~found~~ foundout after 35 to 45 days of Anthesis, depending upon the variety, weather and cultural practices adopted.

On harvesting earlier than the optimum, grain filling may result in a high content of immature and undersized grain. Varieties differ in the rate of moisture release from grain. Thus, the determination of optimum date of harvesting, so that maximum dry matter is accumulated and moisture content is reduced to 15 to 18%. It differs for different varieties subjected to varying agronomic management in different agro-climatic regions.

Objectives: 1. To determine the right time of harvesting sorghum at proper moisture level to minimise field losses.

2. To determine the moisture level for minimum infestation.

The sorghum variety M.35-1 was sown on 6.10.1974. By visual observation, it was found 95% flowering ocdurred on 23.12.1974. As the grain moisture content varies with environmental factors such as Relative Humidity, Temperature of the atmosphere, and amount of rainfall prior to or at the time of harvest, it is not a very reliable index based on which the harvest could be taken. The grain attain biological maturity and filling is complete between 40 to 80 days after 95% of flowering based on duration of varieties namely, early, late and mid-late.

Earheads for moisture estimation from the net plot area on the date of harvest were drawn three times a day from 8.30AM to 2.30PM at an interval of 3 hours commencing from 46th day till 75th day after 95% of flowering on 23.12.1974. Grain moisture was measured by the infrared moisture meter. Special care was taken to remove the surface moisture from the grain sample due to rain or dew formation. Mean values of three such observations were taken as the moisture content of the grain on the plant.

The crop was harvested on the dates noted in the tabular column of Table-1 using sickle by human labour in the morning hours, leaving two rows on all the four

sides of the plot. The produce from the net plot was threshed with 'Akshath' power operated grain Thresher. To find the percentage of broken grain, samples were collected in random from the threshed grain and broken grain are separated and weighed. The loss of grain with husk is also calculated in the same way. Percentage of breakage of grain, Threshing efficiency, power consumption, Cleaning percentage, and percentage of grain loss in husk were noted and tabulated (Table-1).

The grain samples from the field experiment an "Optimum stage of Harvest for sorghum", subsequently used for storage studies to findout the extent of insect infestation. One Kg of samples of grain harvested at different moisture level as shown in the Table-1 were kept in cloth bags, monthly observations were made to findout the emergence of number of adult weevils and the results are noted (Table-2). Care was taken to avoid cross infestation in the laboratory. No fungus attack was observed in any of the samples.

TABLE-1

VARIETY OF SORGHUM:M.35-1(RABI 1974)

Sl. No.	Date of Harvest	No.of days after flowering	Moisture %	Breakage %	Threshing efficiency %	Power consumption watts	Cleaning %	Grain loss in husk %
1.	6.2.75	46	27.0	1.0	85.2	877.50	94.35	11.1
2.	7.2.75	47	24.0	0.5	92.5	634.25	95.38	11.92
3.	11.2.75	51	21.0	0.6	78.0	560.00	98.36	14.28
4.	13.2.75	53	20.2	0.75	96.0	657.00	98.09	6.59
5.	15.2.75	55	18.0	0.75	99.0	576.00	98.52	5.96
6.	17.2.75	57	15.5	1.0	100.0	487.50	97.24	6.97
7.	19.2.75	59	14.1	1.5	94.0	429.00	98.13	8.09
8.	22.2.75	62	12.8	1.5	99.8	483.00	98.10	8.04
9.	1.3.75	69	9.2	2.0	99.8	445.50	98.06	7.8
10.	5.3.75	73	8.8	2.0	91.25	422.50	97.98	7.2
11.	7.3.75	75	9.0	2.1	92.55	416.00	98.16	11.82

TABLE-2

Sl. No.	Dates of Harvest	Moisture level(%)	No.of Weevils emerged I month	II month	III month	IV month	Average
1.	6.2.75	27.0	22	14	15	6	14.25
2.	7.2.75	24.00	13	12	16	6	11.75
3.	11.2.75	21.0	26	6	23	8	15.75
4.	13.2.75	20.2	18	3	16	4	10.50
5.	15.2.75	18.0	13	5	17	13	11.00
6.	17.2.75	15.5	9	2	6	6	5.75
7.	19.2.75	14.1	10	2	10	3	6.25
8.	22.2.75	12.8	9	2	2	4	4.25
9.	1.3.75	9.2	2	0	3	3	2.00
10.	5.3.75	8.8	1	0	2	0	0.75
11.	7.3.75	9.0	2	0	2	0	1.00

Experiment No.1

Location	: Dry lands, University of Agricultural Sciences, Regional Research Station, Raichur.
Season	: Rabi 1974 (October to March).
Variety	: M.35-1
Design	: R.B.D.
Replications	: Four
Plot size: 1. Gross	: 3.6x3.6M
2. Net	: 3x3M
Spacing	: 45cm from row to row 15 cm from seed to seed.
Sown on	: 6.10.1974
95% of flowering	: 23.12.1974

Treatments

Stages of harvest

S_1	: 46 days
S_2	: 47 days
S_3	: 51 days
S_4	: 53 days
S_5	: 55 days
S_6	: 57 days
S_7	: 59 days
S_8	: 62 days
S_9	: 69 days
S_{10}	: 73 days
S_{11}	: 75 days

Experiment No.2

Two varieties of sorghum CSH-1 and D.340 were sown on 11.7.1975. By visual observation it was found 95% of flowering of CSH-1 occurred on 30.8.1975 and 95% of

Some samples were drawn from the net plot area on 4.10.1975 and 18.10.1975, after analysing, it was found that the crop was attacked by smut and earhead bugs due to heavy rainfall (45") during the months of September and October, which is unusual to this tract. Visited the plot on 20.10.1975 and examined, major portion of the crop has been damaged. The undamaged crop available from the plot is not sufficient to conduct the experiments. So, this experiment will be repeated during next season.

Results:

Experiment No.1

It is inferred from the data that the minimum power consumption, minimum breakage of grain, maximum threshing efficiency, maximum percentage of cleaning of grain and minimum loss of grain in husk was observed at 15.5% Moisture content at a speed of 475 rpm of the threshing drum. That means, there will be maximum recovery of the grain per unit area when this variety of sorghum is harvested and threshed after 57 days after 95% of flowering or at 15.5% moisture content of the grain on the plant.

FIG: 1

THRESHING EFFICIENCY IN PERCENT AT DIFFERENT MOISTURE LEVELS OF SORGHUM

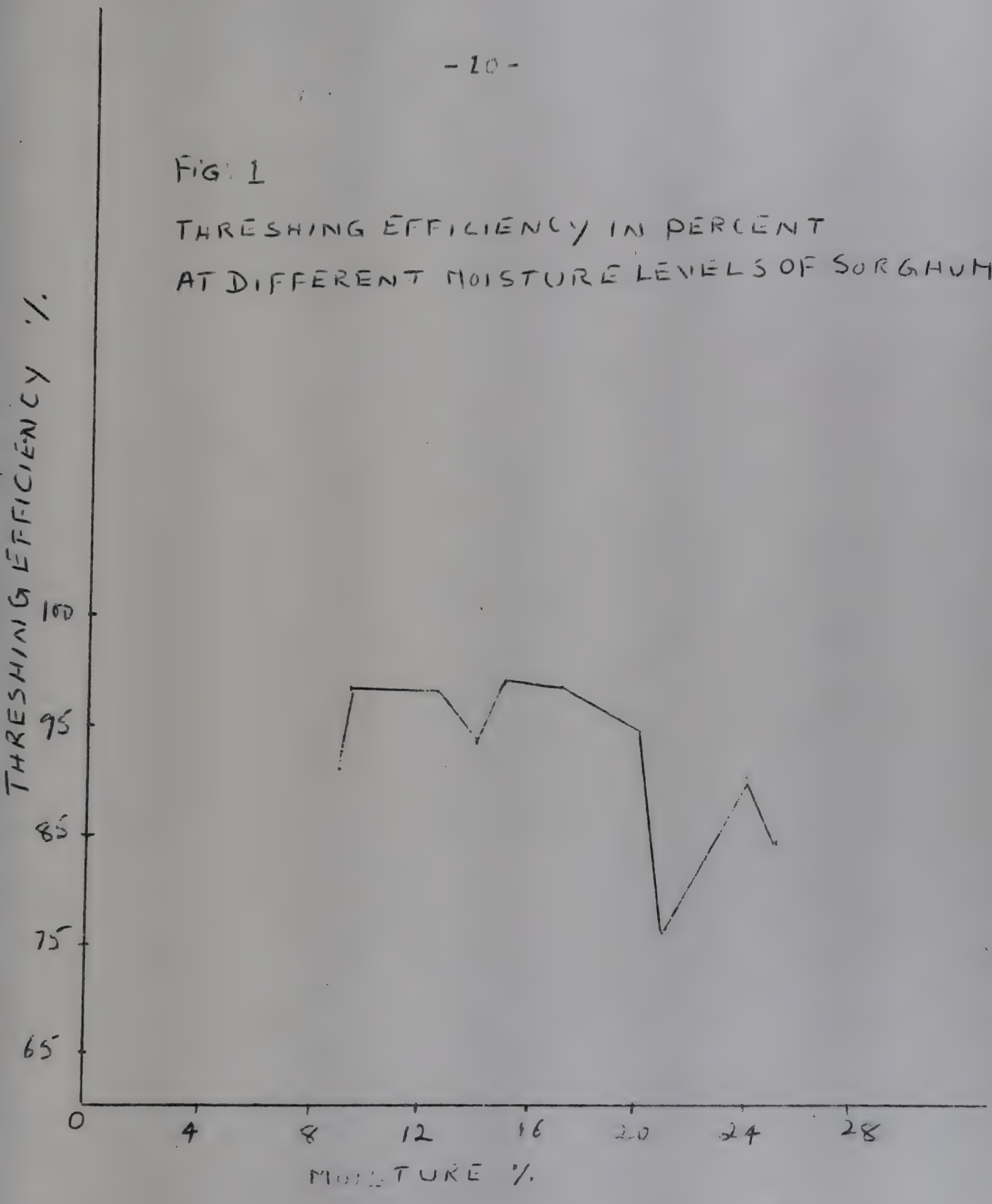


FIG: 2

POWER CONSUMPTION IN WATTS TO THRESH SORGHUM AT DIFFERENT MOISTURE LEVELS

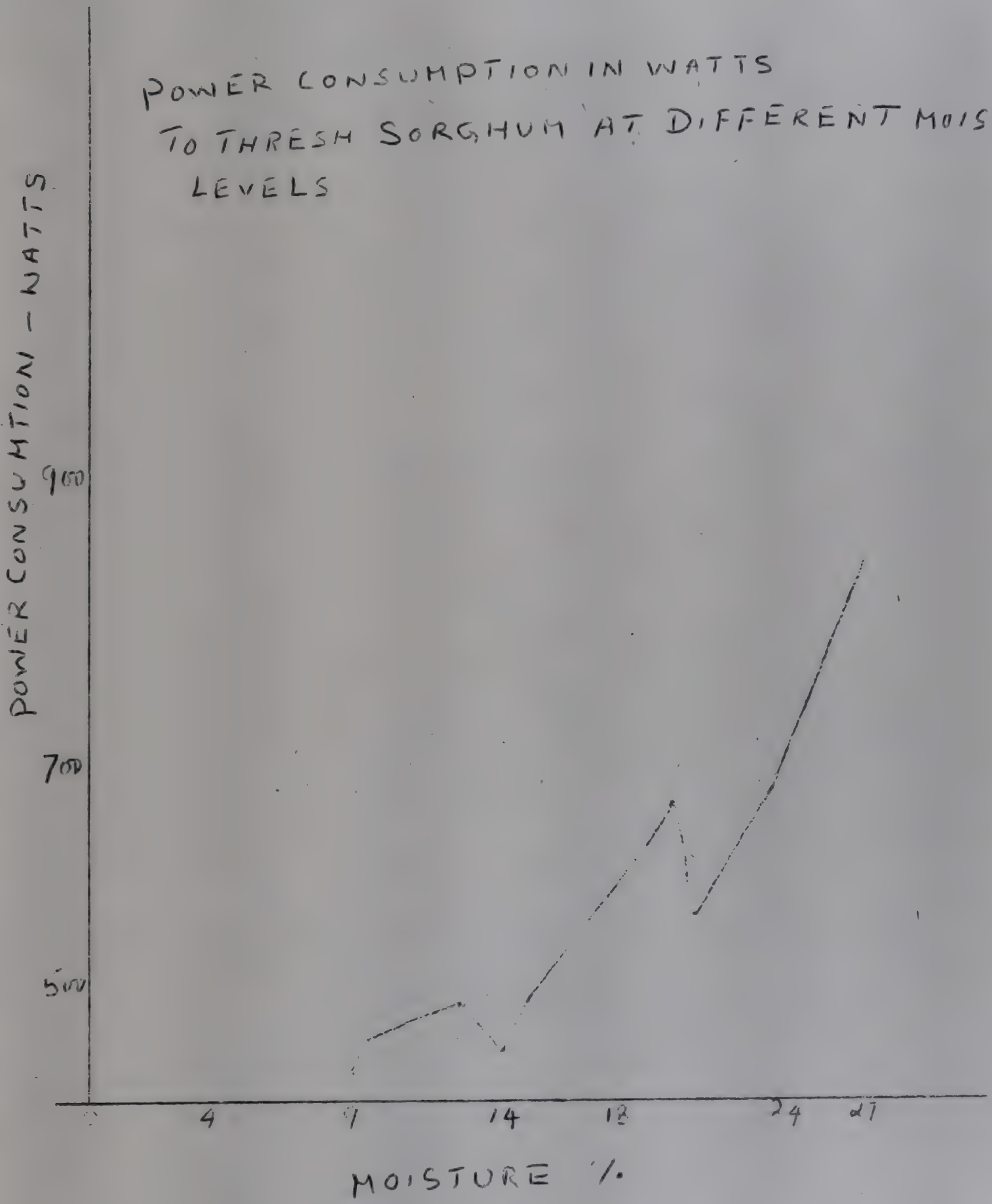


FIG: 3
BREAKAGE OF SORGHUM GRAIN IN PERCENT WHILE THRESHING AT DIFFERENT MOISTURE LEVELS.

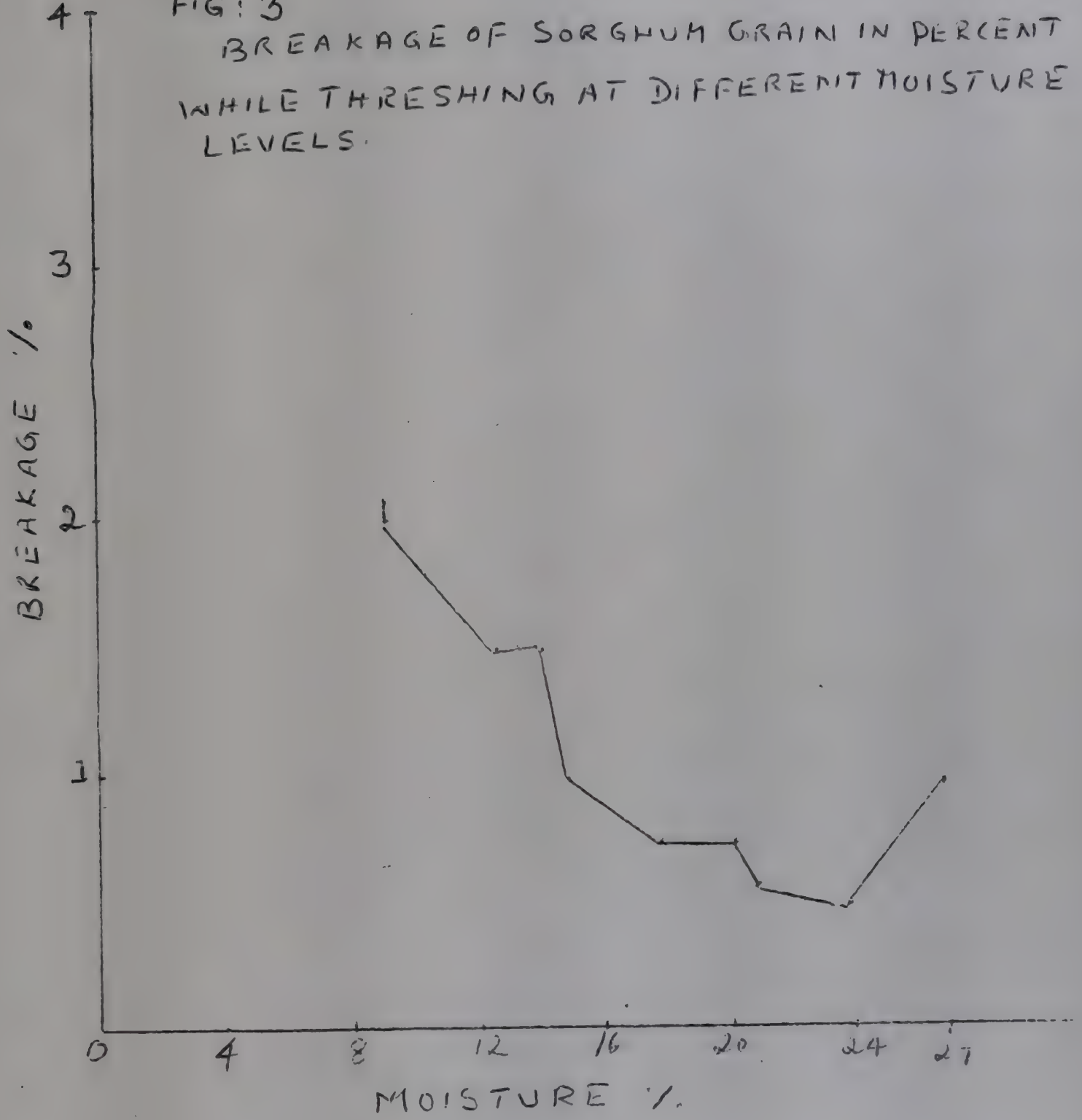


Fig: 4.

SORGHUM GRAIN LOSS IN HUSK IN PERCENTAGE WHILE THRESHING AT DIFFERENT MOISTURE LEVELS

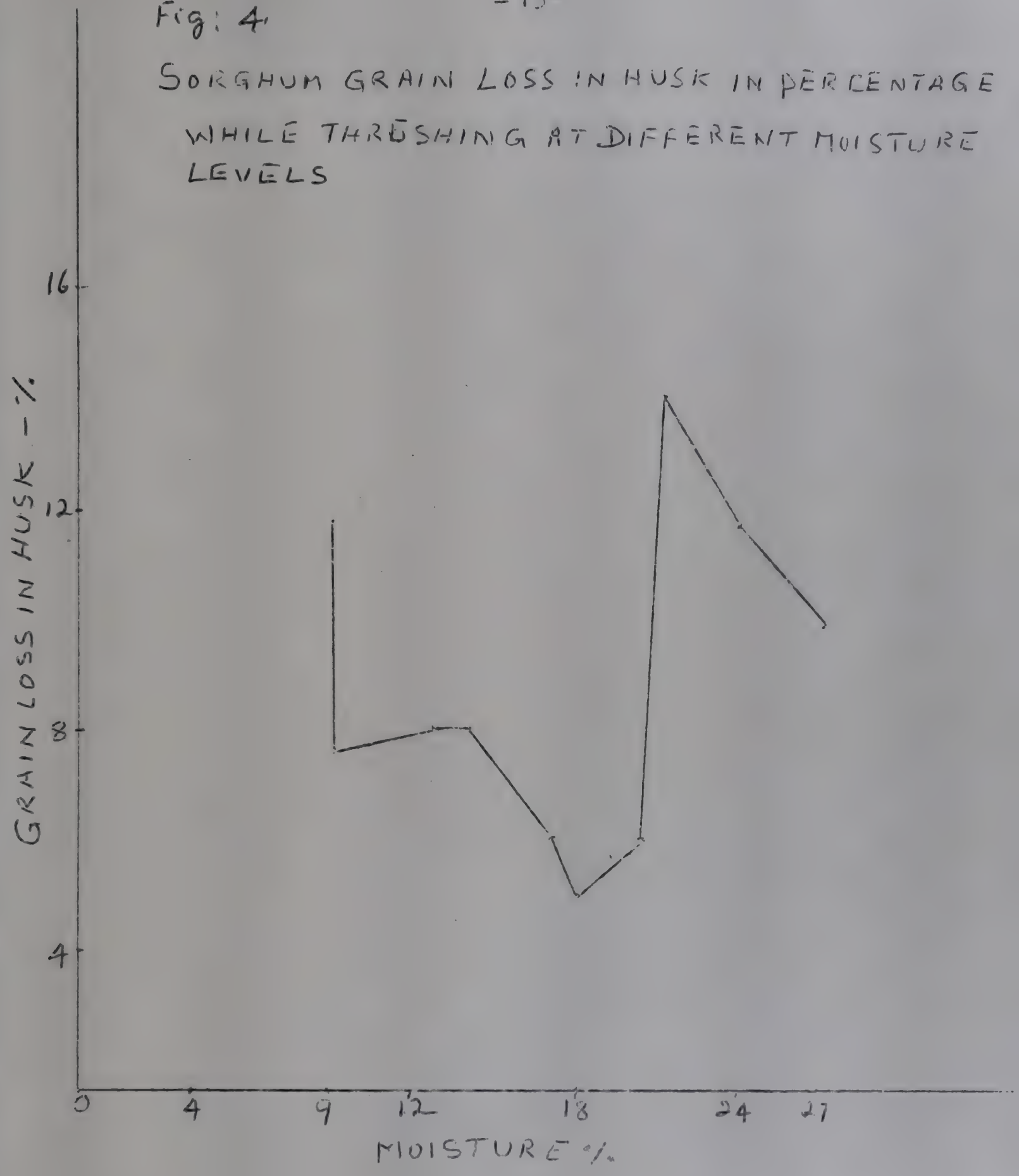
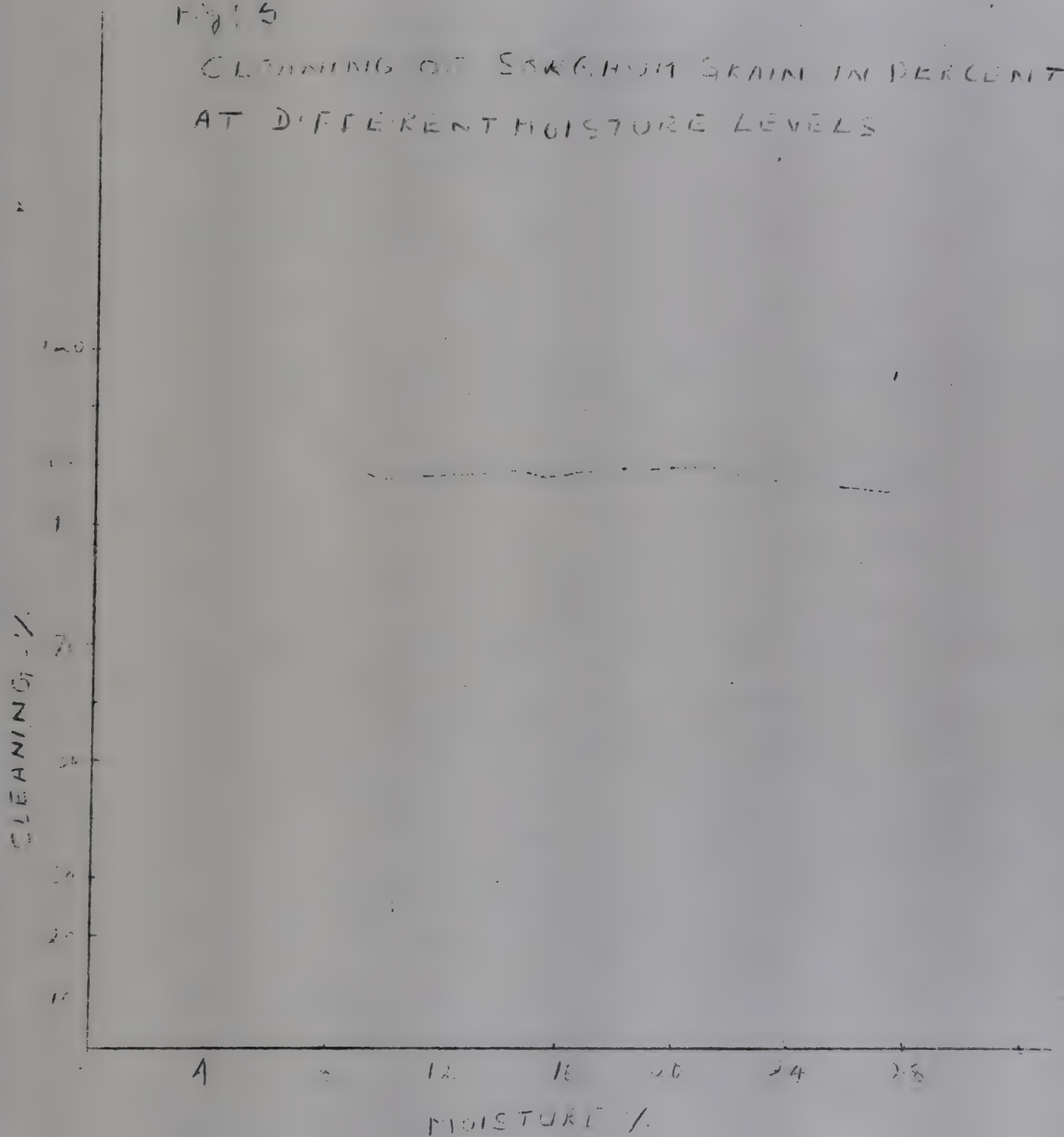


Fig: 5

CLEANING OF SORGHUM GRAIN IN PERCENT AT DIFFERENT MOISTURE LEVELS



PROJECT NO.3 I.C.A.R.CODE NO.$T_8/72$.

Title: TESTING AND EVALUATION OF DIFFERENT STORAGE BINS.

Investigators: 1. Mr.S.D.Shashidhara (Till 7.8.75)
2. Mr.K.C.Krishnamurthy
3. Mr.H.P.Prabhuswamy
4. Mr.D.Keshavamurthy

Date of start: December, 1973.

Likely date of completion: December, 1977.

In India it is estimated that 10% of the grain are lost annually due to improper storage. Generally the grain are stored in gunney bags and in rooms. In a few cases in underground structures like Hagevu and Vadevu.

The grain is a poor conductor of heat, hence heat produced by respiration of grain and insects is not quickly conducted and leads to development of hot spots, there by giving room for increase in moisture in cooler region, thus paving way for deterioration of grain. This condition is particularly met ~~within~~ within some of the underground structures which are of air tight and also open air silows which are expose to sun. Hence selection of proper storage structure for different environmental conditions and to provide necessary provision to overcome the above difficulties is absolutely necessary.

Insect infestation and other micro-organisms of the grain depends upon the factors, i.e., moisture content of grain, oxygen availability and temperature gradient. In cases of gunney bags and room storage, grain is liable to pickup moisture from atmosphere due to humid weather and also moisture from the damp floor, walls etc. Free air availability helps in development of insect pests. The rodent damage is also more predominent in gunney bag and room storage. To minimise direct loss and also contamination of the produce with insect fragments and foreign materials, to safeguard the health hazards of the consumer, well designed storage structures of insect proof and moisture proof to preserve the biochemical quality of the grain stored, a critical evaluation is necessary, before to develop and advocate new storage practices using locally available materials.

Objectives: Different types of improved and local storage bins will be procured and fabricated. Bins will be tested for their relative performance with regards to moisture migration, temperature gradient , Insect infestation and their relative economics will be workedout with a view to suggest to the farmers a suitable storage bin to reduce the storage losses.

Experimental Details: The following storage bins were constructed and fabricated as per the drawings shown in the figures:

a) Pusa Bin.
b) Domestic type metal Bin(Garelukothi).
c) Gumme with rat proof projection.
d) Gumme with polythelene lining.

Pusa Bin: Is of double walled with polythene lining in between the inner and outer wall. The construction details are shown in Figs.6 and 7.

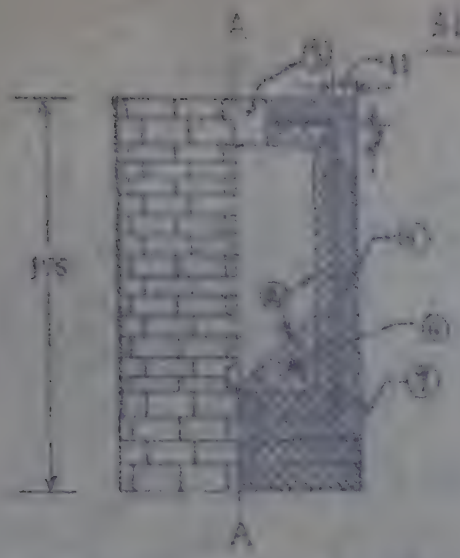
Domestic metal bin: Was fabricated by making use of G.I. sheet of 24 gauge with provision for filling and emptying. At three places, M.S.Flat rings are provided for strength. Dimension and other details are shown in the Fig.8.

Gumme: A medium type storage structure made out of locally available Bamboo mats smeared with cowdung mixed with mud. This storage structure is very popular in rural part of Raichur district to store small quantity of grain for a short period. Two gummes were constructed with rat proof projection at the bottom as per the details shown below in the Figs.9 and 10. Polythene lining is used in one of the gumme.

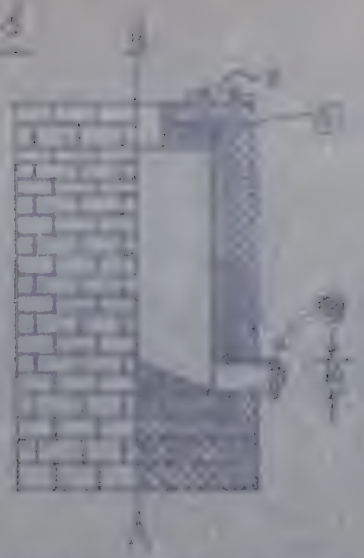
Experiments with mixture of Rabi jowar were done during June 1974. The storage structures,

SCALE 1:10 CM

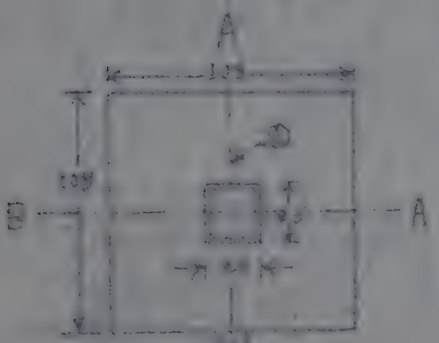
ALL DIMENSIONS IN CMS



SECTIONAL ELEVATION



SECTIONAL END VIEW



PLAN

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1	GROUTED GRANITE SLAB JOINT
2	PLASTERED WITH CEMENT MORTAR
3	WOODEN FRAME [illegible]
4	GRANITE SLAB [illegible]
5	POLYTHENE GUARD
6	BRICK BATS FILLING
7	BURNT BRICK MASONARY WITH CEMENT MORTAR.
8	PLUG (W.C.)

MODIFIED PUSA BIN

Fig No 8

H.R.H.T. SCHEME

A.F.C.A.S RAICHUR

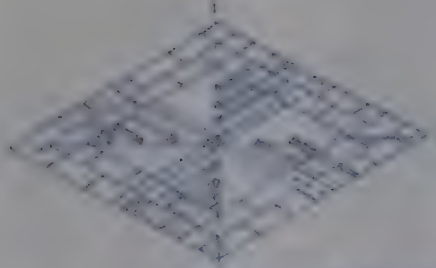
DRN

APD

SCALE 1MM = 4CM

ALL DIMENSIONS IN CMS

ELEVATION



PLAN - B.C.S. - AA

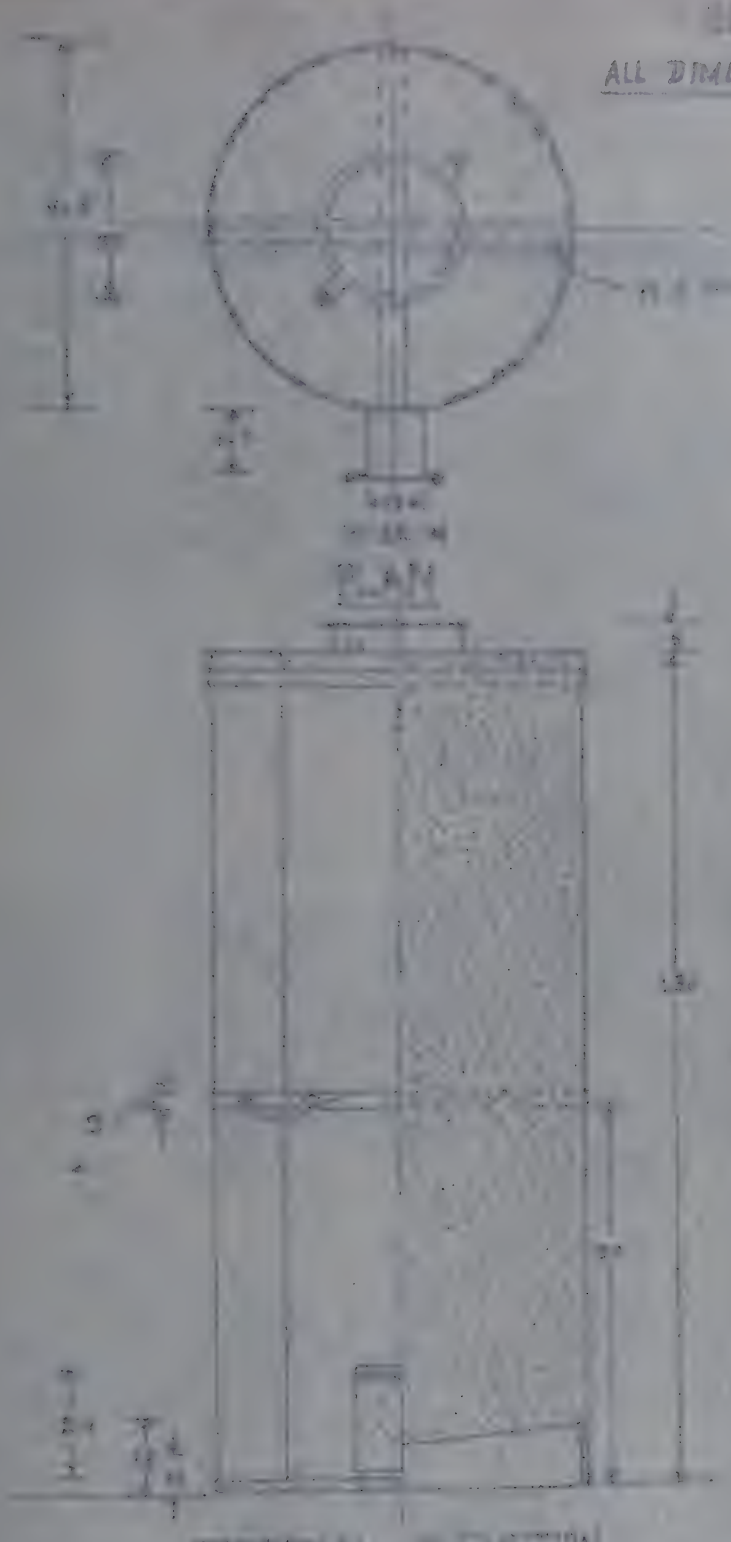
MODIFIED PUSA BIN

FIG No. 7

B.P.H.T. SCHEME
A.E.I U.A.S. RAICHUR.
DRN:
APD:

SCALE 1:20

ALL DIMENSIONS IN CM.



PLAN

SECTIONAL ELEVATION

DOMESTIC TYPE IV (RURAL) WITH EV

Fig. No. 11

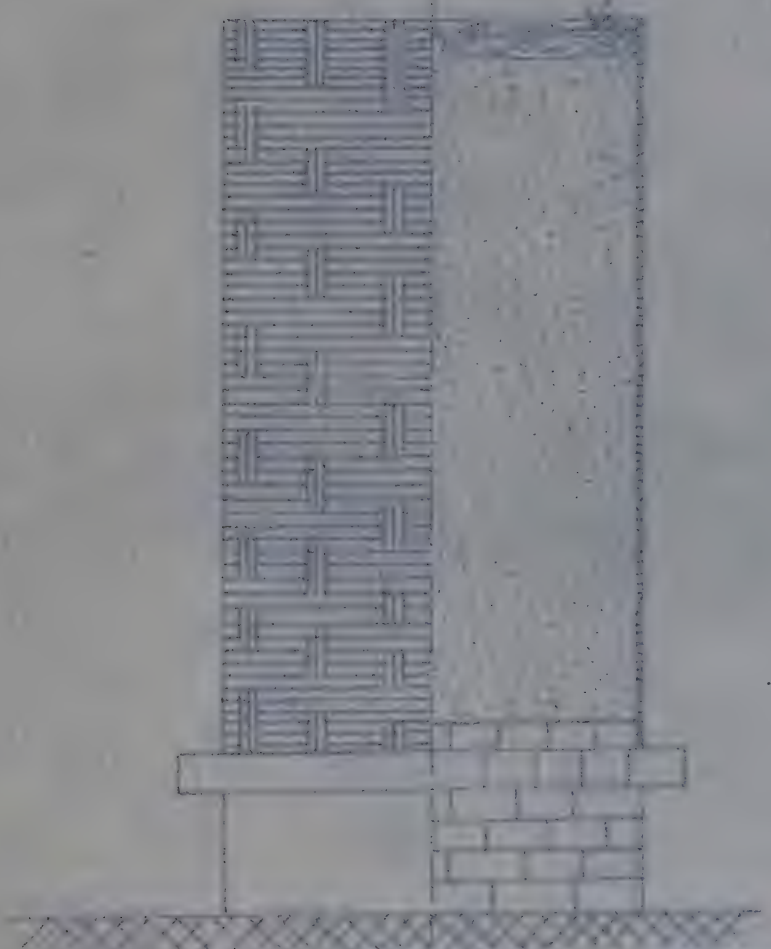
R.E.W.T. SCHEME

A.E.U.A.S. BANGALORE

DRN

AED

PLAN



ELEVATION

GUMME

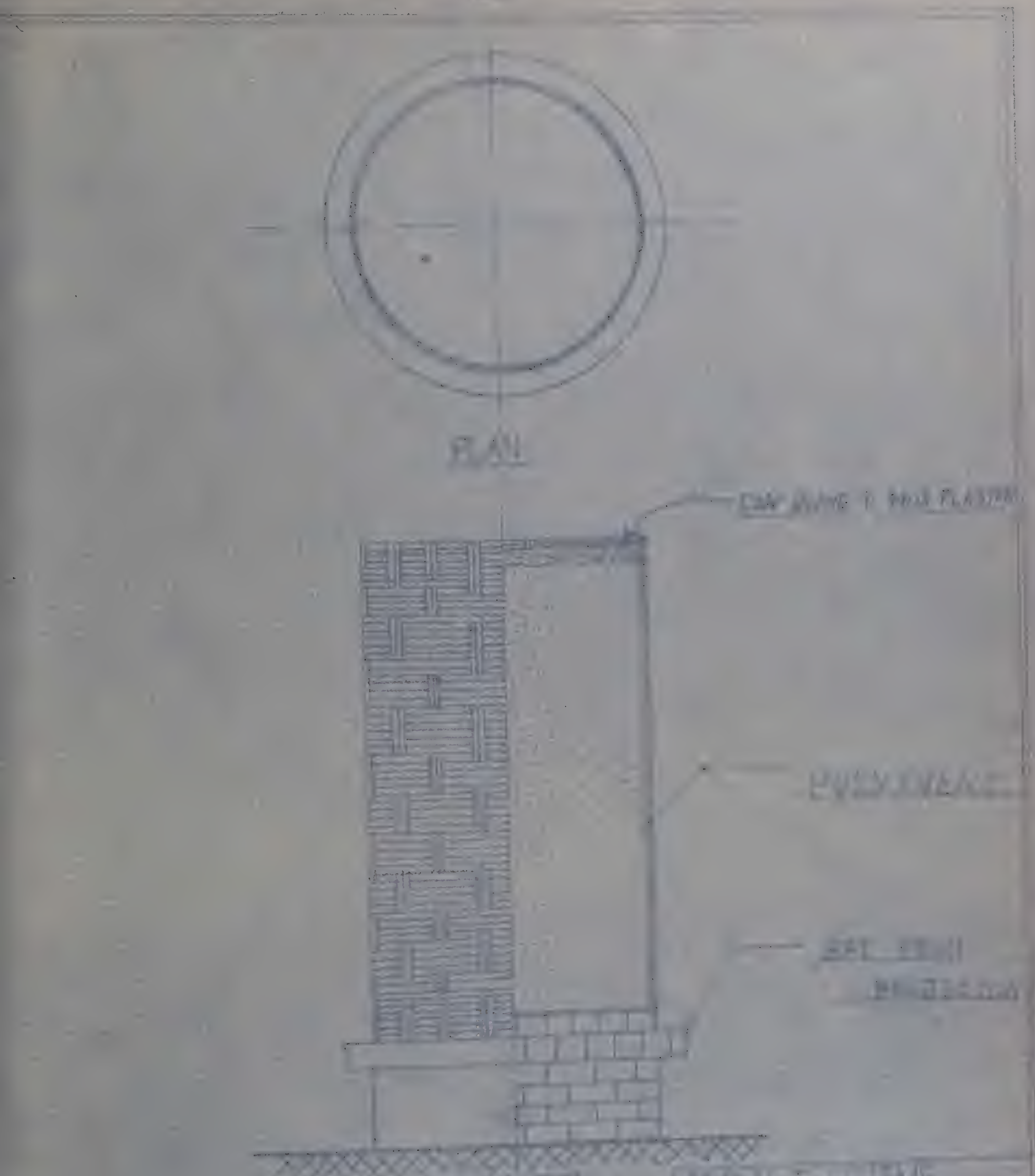
Fig No 9

R.P.H.T SYSTEME

A.E.L.D.A.S RADIUR

DRN

APD


PLAN
ELEVATION
B.P.H.T. SCHEME
WITH POLYTHENE LINING
FIG. No. 10

Gumme without polythene lining and also without rat proof projection was taken up for studies but, within a short period grain were attacked by rats and also grain were subjected to heavy insect infestation. So, the experiments were discontinued.

Fresh experiments were commenced on July, 1975 to study the suitability of pusa bin, metal bin and Gumme. All these storage bins were filled with mixture of Rabi Jowar on different dates.

From all the storage bins samples were drawn from the three zone i.e., Bottom, Middle, and Top using a grain sampler. The pest infestation was recorded by taking a known quantity of samples (floating it in saturated salt solution, account was made and expressed as a percentage on number basis). The temperature in different zones are also recorded with the help of thermometers and moisture was estimated by using Universal moisture meter.

Results: The observations made under this experiment till October, 1975 after storage are given in the Tables-3 to 6. From the observations, it is found, that, temperature varies about 2°c and moisture varies

TABLE-3

MODIFIED PUSA BIN

Capacity-4 Quintals
Grain: Rabi Jowar Mixture

Date of storage: 19.6.1975.
Moisture content: 8%
Room temperature at the time of storage: 28°C

Probing points		Total height of grain cms	Height of probing points from bottom cms	Date of record	T-emperature °C	Moisture %	Insect infestation %	D.B. Temp. ° C	W.B. Temp. °C	R.H. %	Remarks
EAST	A	176	74	17.7.75	30.0	8.5(Av)	0.5	31.0	28.5		
	B				29.0						
	C				28.5						
NORTH	D	44			28.5						
	E				30.0						
	F				28.0						
	G				28.0						
WEST	H	134			29.0						
	I				28.0						
	J				29.0						
	K				29.5						
SOUTH	L	104			30.0						
	M				29.5						
	N				29.0						
	O				30.0						

TABLE-3(Contd)

Probing points		Total height of grain cms.	Height of probing points from bottom cms	Date of record	Temperature °C	Moisture %	Insect infestation %	D.B. Temp. °C	W.B. Temp. °C	R.H. %	Remarks
EAST	A	176	74	14.8.75	28.5	9.0(Av)	10(Av)	31.5	28.5		Very high insect infestation of the grain was noticed, this may be due to some constructional defects. So, bin was emptied to rectify the defects.
	B				29.0						
	C				29.5						
NORTH	D	44			29.0						
	E				29.5						
	F				29.0						
	G				29.5						
WEST	H	134			29.5						
	I				29.0						
	J				29.5						
	K				30.0						
SOUTH	L	104			29.0						
	M				29.0						
	N				30.0						
	O				30.0						

TABLE-4

Date of storage: 3.6.1975.
Moisture content: 8%
Room temperature at the time of storage: 33°c

METAL BIN

Capacity-8 Quintals
Grain: Rabi Jowar Mixture

Probing points	Total. Height of grain cms	Height of probing points from bottom cms	Date of record	Temperature °C	Moisture %	Insect infestation %	D.B. Temp. °C	W.B. Temp. °C	R.H. %	Remarks
A	175	13	11.7.75	27.5	8	0.0	28.5	26.5		
B		58		27.0	8	0.0				
C		110		27.0	8	0.0				
D		142		27.0	8	0.0				
E		168		26.5	8	0.0				
A	175	13	14.8.75	29.5	8	0.5	31.5	27.5		
B		58		29.0	8	0.5				
C		110		29.5	8	0.5				
D		142		30.0	8	0.5				
E		168		30.0	8	0.5				
A	175	13	11.9.75	28.0	8.8	0.5	25.5	22.5		
B		58		27.0	8.8	0.5				
C		110		28.0	8.8	0.5				
D		142		28.5	8.8	0.5				
E		168		28.0	8.8	0.5				
A	175	13	16.10.75	28.5	9.1	0.7	26.0	23.0		
B		58		28.0	9.2	0.7				
C		110		29.0	9.0	0.7				
D		142		29.5	9.2	0.7				
E		168		28.5	9.6	0.7				

TABLE-5

GUMME

Date of storage: 23.7.1975.
Moisture content: 11.2%
Room temperature at the time of storage: 30°C

Capacity-4 Quintals
Grain: Rabi Sowar Mixture

Probing points	Total height of grain cms	Height of probing points from bottom cms	Date of record	Temperature °C	Moisture %	Insect infestation %	D.B. Temp. °C	W.B. Temp. °C	E.H. %	Remarks
A	140	20	20.8.75	30.5	12.0	0.0	28.5	25.5		
B		56		31.0	10.8	0.0				
C		110		30.5	12.2	0.0				
A	140	20	17.9.75	30.5	11.4	2.0	27.5	25.00		
B		56		32.0	11.6	2.0				
C		110		31.5	11.8	2.0				
A	140	20	15.10.75	34.0	11.7	4.0	26.5	22.0		
B		56		33.0	12.5	4.0				
C		110		32.0	12.0	4.0				

TABLE-6

GUMME(WITH POLYTHENE)

Date of storage: 23.7.1975.
Moisture content: 11.2%
Room temperature at the time of storage: 30°C

Capacity-4 Quintals
Grain: Rabi Jowar Mixture

Probing points	Total height of grain cms	Height of probing points from botton cms	Date of record	Tempe-rature °C	Mois-ture %	Insect infes-tation %	D.B. Temp. °C	W.B. Temp. °C	R.H. %	Remarks
A	110	15	20.8.75	30.0	11.2	0.00	23.5	25.5		
B		43		30.5	11.6	0.00				
C	1	100		30.5	11.2	0.00				
A	110	15	17.9.75	30.5	11.2	1.00	27.5	25.0		
B		43		31.0	11.2	1.00				
C		100		30.0	11.6	1.00				
A	110	15	15.10.75	30.5	11.2	1.5	26.5	22.0		
B		43		29.0	11.1	1.5				
C		100		29.0	11.4	1.5				

about 2% in all the storage structures under study.

The Insect infestation in Metal Bin and gumme varies from 0.5% to 4%.

It is inferred from the data that there is not much variation in grain temperature and moisture in different zones as well as in different structures. The grain temperature was slightly higher than the room temperature. In pusa bin due to some constructional defects with regards to probing points more pest infestation was found during the second month itself. So, grain were removed from this bin and observations are discontinued.

In metal bin it was observed there is no much variation either in moisture or in temperature at any of the zones and also pest infestation was negligible, when compared to gumme. The moisture variation in gumme without polythelene was more at the top layer than the gumme with polythene lining. Pest infestation was also very less in gumme with polythelene lining. So gumme with polythene lining is better than gumme without polythelene with regards to insect development. But difficulty is in handling the grain in this type of gummes.

Further studies will be taken up to incorporate some means for easy handling of the grain without any damages to the structure.

PROJECT NO.4 I.C.A.R.CODE NO.$T_{13}/72$.

Title: EFFECT OF VARIOUS AGRONOMICAL INPUTS AND TREATMENTS ON THE QUALITY OF GRAIN AND POST-HARVEST OPERATIONS.

Investigators: 1. Mr.K.C.Krishnamurthy
2. Mr.H.P.Prabhuswamy
3. Mr.B.V.Ramakrishna(Resigned on 4.8.75)

Date of start: July 1975.

Likely date of completion: 1977.

Objective: To findout the effect of fertilizers and other chemicals applied to the crop to maintain the quality of grains and also on the nutritional value of grain.

Material and Methods: The following varieties and treatments were planned and the crop was sown on 15.7.1975.

Varieties: 1. CSH-1.
2. CSH-5.
3. Local-70.

Treatments: 1. 0 Nitrogen.
2. 25 Nitrogen.
3. 40 Nitrogen.
4. 60 Nitrogen.
(P & K constant)

No.of replications: Four.

Plot size: 3.6 mt. x 2.25 mt.

Now, the crop is in dough stage and will be ready for harvest by 10th November, 1975. After harvest, the grain from each treatment will be stored separately,

biochemical and post-harvest analysis will be done and reported in next years' report.

PROJECT NO.5 I.C.A.R.CODE NO.G-14-A/72.

Title: PRE-HARVEST CHEMICAL TREATMENT TO CONTROL STORAGE GRAIN PEST S OF SORGHUM.

Investigators: 1. Mr.K.C.Krishnamurthy.
2. Mr.H.P.Prabhuswamy.

Date of start: June, 1974.

Likely date of completion: 1976.

Objectives: To find out the safe and effective chemical to control the stored grain insect pests which are infesting in the field.

Material and Methods: The following chemicals were selected which are already recommended to control the earhead pests of sorghum.

Chemical	Dosage
1. Malathion 5% dust	8 Kgs/acre
2. Carbaryl 5% dust	8 Kgs/acre
3. Endosulfan 4% dust	9 Kgs/acre
4. Trichlorfon 5% dust	8 Kgs/acre
5. Malathion 50 E.C.	0.1%
6. Carbaryl 50 W.P.	0.2%
7. Endosulfan 35 E.C.	0.07%
8. Trichlorfon 40 E.C.	0.1%
9. Untreated control	--

The crop was treated with above chemicals approximately one month and 15 days before the harvest of the crop.

After harvest the earheads were threshed and 1 Kg of grains were collected in each treatment and kept for

further observation on the memergence of adult insects.

At an interval of one month, after harvest the grain were sieved and the number of adult weevils were counted in each sample and recorded.

Two experiments have already been completed and the third experiment is under progress.

Experiment 1: Season - Kharif 1974
Variety- CSH-1
No.of treatments-9
No.of replications-4

Experiment 2: Season - Rabi 1974
Variety- R-16
No.of treatments-9
No.of replications-4

Results obtained in two experiments are given in Table-7.

Results: The above figures are the average of four replications and four observations. From the above table, it can be seen that malathion, carbaryl and trichlorfon were effective in controlling the stored pests which are infesting the crop in the field.

The third experiment was started on 14.7.1975. Variety CSH-1. The crop is in dough stage. First treatment was given on 26.9.1975. Due to heavy rains

TABLE-7

No.	Treatments	Average No.of insects/obsn. I Expt.	II Expt.
1.	Malathion 5% dust	8.66	0.2
2.	Carbaryl 5% dust	6.80	0.1
3.	Endosulfan 4% dust	10.89	10.1
4.	Trichlorfon 5% dust	8.41	0.8
5.	Malathion 50 E.C.spray	9.37	4.5
6.	Carbaryl 50 W.P.	6.37	1.1
7.	Endosulfan 35 E.C.spray	6.68	17.2
8.	Trichlorfon 40 E.C. spray	5.91	1.0
9.	Untreated control	12.10	27.2

second treatment could not be given as per the schedule. Visited the plot on 18th October, 1975, after examination it was found most of the grains have been germinated in the earhead itself and most of the earheads have been attacked by sooty mould. So, this experiment will be repeated and results will be reported in next years annual report.

PROJECT NO. 6 I.C.A.R.CODE NO.G-14-B/72.

Title: ESTIMATION OF STORAGE LOSSES DUE TO INSECT PESTS.

Investigators: 1. Mr.K.C.Krishnamurthy.
2. Mr.H.P.Prabhuswamy.

Date of start: June, 1974.

Likely date of completion: 1977.

Objectives: To estimate the storage losses due to insect pests at farmers level.

Experimental approach: Two farmers in each talukas of Raichur, Gulbarga, Bellary and Dharwar Districts, where sorghum is extensively grown were selected visits were made to each farmers' house, noted the type of storage and samples were collected from each type of storage. The samples thus collected were analysed in the laboratory as per the guide lines of Indian Grain Storage Institute, Hapur, Uttar Pradesh, and percentage of infestation were recorded (Table 8).

Further visits will be made once in 3 months and percentage of infestation will be recorded as per the procedure. Final results will be reported in the next years report. Table-8 represents the percentage of infestation during the past visits.

TABLE-8

Villages visited	District	Taluk	Type of storage	Percentage of infestation	
				I Visit	II Visit
Bidanal	Dharwar	Hubli	Hagevu (under ground)	1%	3%
Adaragunchi	-do-	-do-	-do-	6%	7%
Gotur	Bellary	Bellary	Room-storage	0.1%	-
Banapura	-do-	-do-	-do-	1%	-
Gulbarga	Gulbarga	Gulbarga	Room	2%	-
Kalanur	-do-	-do-	-do-	2.3%	-

In addition to the above, duration of storage, chemical treatments, if any, were also recorded.

PROJECT NO.7 I.C.A.R.CODE NO.T_4/73.

Title: DEVELOPMENT OF LESS EXPENSIVE CLEANER FOR GROUNDNUT AND SORGHUM.

Investigators: 1. Mr.K.C.Krishnamurthy.
2. Mr.D.Keshavamurthy.

Date of start: December, 1974.

Likely date of completion: December, 1977.

Objectives: At Regulated Markets and Mandies grain coming are not cleaned. Suitable less expensive cleaners should be developed to clean the grains at farmers level ~~or at~~ Mandies and Markets.

Progress: Review of literature is being done for product-planning and development. In this regard, a power operated cleaner which was available was tested for groundnut cleaning. Based on the same principle, a foot or hand operated groundnut cleaner will be developed keeping in view the initial cost, and its performance.

Prototype model will be developed by the end of 1975.

PROJECT NO.8 I.C.A.R.CODE NO.T_8/73.

Title: MODERNISATION OF GRAIN MARKETS.

Investigators: 1. Mr.K.C.Krishnamurthy.
2. Mr.H.P.Prabhuswamy.
3. Mr.D.Keshavamurthy.

Date of start: December. 1974.

Likely date of completion: December, 1977.

Objectives: 1. To study the losses facilities provided in t the existing regulated grain market yards of Raichur, Gulbarga and Bellary Districts of Karnataka with regards to Post-Harvest operations and transportation.

2. To suggest some feasiable solutions for the bottle necks if any, with regards to space, time and labour during the marketing and transportation operations.

Experimental approach: A reconnaissance survey of the Raichur Agricultural Regulated Market yard has been completed. The food corporation of India has no branch at Raichur. Hence officials of FCI could not be contacted. This marketing yard is under the control of Karnataka Marketing board. Contacted the officials of the marketing board and explained to them the obje-, ctives of our investigation. Raichur regulated market is one of the biggest market in Karnataka state. The major items found in the marketing yard are cotton and groundnut. Due to restrictions on food grain movements by the Government of Karnataka, it was not possible to trace out even a single bag of food grain during our visits.

Heaps of groundnut were seen at the market yard. On enquiry, it is found, immediately after harvest major portion of the heaps were brought to the market yard without proper drying and cleaning. Means of transportation was mainly bullock cart, tractor trailers and trucks. Market has good layout, but there are no mechanical dryers, gardens or cleaners. This year, Raichur received 1200 mm of rainfall by 15th October, 1975. Where as annual average rainfall in the past was 400 mm. No any type of shelters have been provided in the marketing yard and farmers also were not aware of this unusual situation to equip themselves. Most of this years' kharif groundnut produce was spoiled due to mould formation. To evaluate the handling problems of groundnut at mandi level during this kharif season five mandies in Raichur market yard have been selected. But, due to non-availability of technical staff in adequate number required for carrying out this work, progress could not be achieved.

The officials of marketing board Raichur has promised us to furnish the detailed drawings for their projected future plans. After studying these plans and drawings suggestions will be made for development of this marketing yard, keeping in view, minimisation of grain losses at all level.

PROJECT NO.9 I.C.A.R.CODE NO.$T_7/73$.

Title: EXAMINATION OF EXISTING STORAGE PRACTICES IN KARNATAKA STATE FOR THEIR IMPROVEMENTS.

Investigators: 1. Mr.S.D.Shashidhara (Till 7.8.75)
2. Mr.K.C.Krishnamurthy
3. Mr.H.P.Prabhuswamy
4. Mr.D.Keshavamurthy

Date of start: July, 1973.

Likely date of completion: July, 1977.

Objectives: 1. To study the existing storage practices in Raichur district and to collect the samples of grain for assessing the storage losses at farmers' level.

2. To suggest the improved methods to avoid the storage losses.

All nine taluks of Raichur district was surveyed by selecting two villages in each taluk. In all 70 farmers were contacted and the details were collected in the proformae supplied by Indian Grain Storage Institute, Hapur, Uttar Pradesh. During the survey most of the farmers said that they are storing only for their consumtion and the rest will be sold soon after the harvest. So, most of the storage structures were of a small capacity and temporary nature. The following different structures were used by the farmers. The line digrams are as shown in the Figs.11 to 18.

Room Storage: The grain were stored in rooms in bulk or in gunney bags. The store rooms are mainly brick walled and the roof is terraced or tiled (country or Mangalore tiles). Generally, the store rooms are not ventilated. This method is not rodent and insect proof, as the most of the buildings are of mud construction.

Gumme: This is a bamboo structure with cowdung plastering. Capacity ranged from 3 to 5 quintals. The approximate cost is about Rs.10/=. This is also not rodent and insect proof (Fig.11).

Pure: This is made of paddy straw. Approximate capacity is 10 to 20 q-uintals. This is kept in open field. Stored only for short period. This is also not rodent proof. This is used for mostly storing paddy (Fig.12).

Vodlu Ponaka: This is a very small capacity structure of about 2 quintals. This is made of thick bamboo and coated with cowdung on both sides. Grain are stored for a short period for consumption. Approximate cost is Rs.15/=. This is also not rodent and insect proof (Fig.13).

Gadhi: This is a permanent structure made of mud with bamboo reinforcement. Roof of paddy straw is provided.

PLAN

ELEVATION

CULVERT

Fig. No 11

PLAN

ELEVATION

PURE

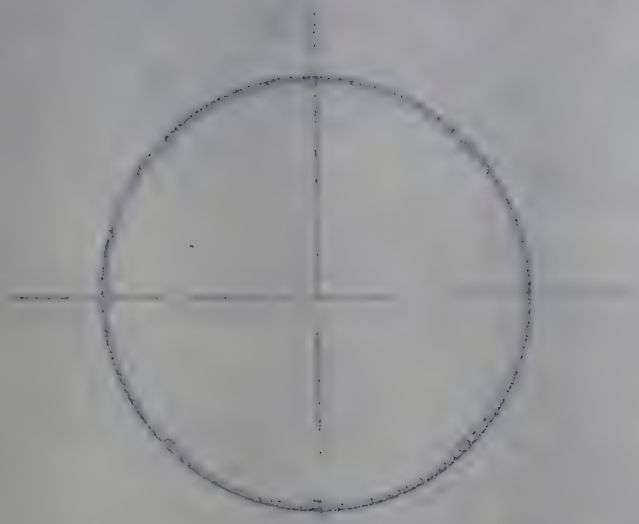
U.P.R.T BOIGNE

A.E.T.U.A.E RAICHEL

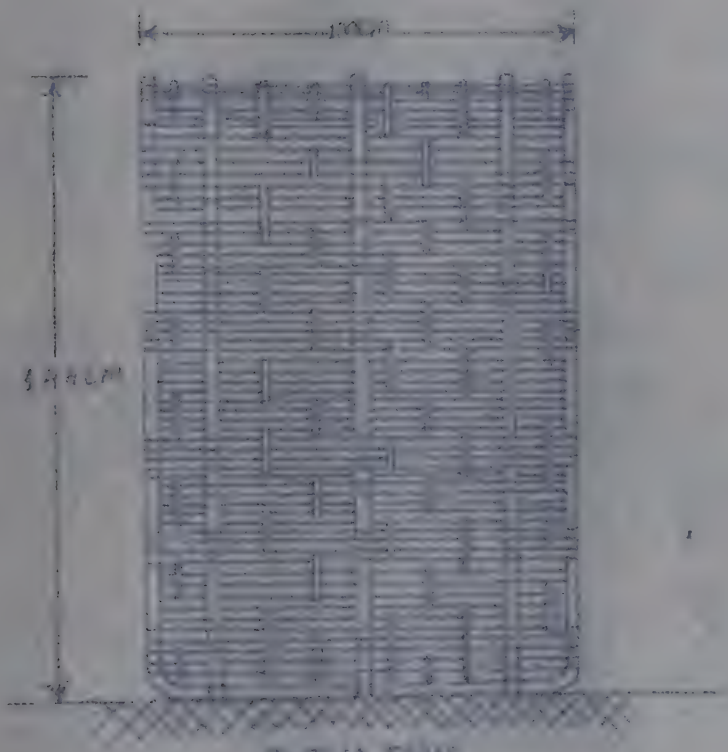
DRW:

APP

SCALE 1 MM = 2.0 M



PLAN



ELEVATION

VIDALE PANAKA

Prof No 13

H.P.H.I. SCHEME

A.E.I. U.A.S. RANCHI

DRN: [illegible]

APD: [illegible]

SCALE 1"-6'

PLAN

ELEVATION

HADHI

Dr. No. 15

APP:

PLAN

ELEVATION

GALGA

Fig No 15

H.Q.P.H.C. SQUADRON
A.D.C. U.A.S. RAIGARH
DRN
APD

PLAN

ELEVATION

CARTOHAN-POT

Fig. No 16

P.P.E.T. SCHEME

A.E.I. U.A.S. RAICHUR.

DRN.

APD

There will be a manhole of 2'x2', capacity of the structure is 20 to 30 quintals and costs about Rs.500/= (Fig.14).

Galagi: Similar to that of ponaka used for storing grain for daily consumption. Capacity ranged from 1 to 2 quintals. This is also of thick bamboo construction with cowdung coating (Fig.15).

Earthern pot: This is a small capacity structure of maximum 1 quintal. This is used to store grain for daily consumption. This is rodent proof (Fig.16).

Underground structures: There are two types of underground structures.

Hagevu: This is nothing but a cylindrical pit dug in mostly red soils, with an opening of about 80 cms diameter at the top, which is covered with a circular stone lid and then packed with mud. No lining is done, but the sides and the bottom are covered with husk and straw of Sorghum. Removal of grain from this structure is somewhat difficult. The capacity ranges from 20 to 40 quintals and the cost is about Rs.200/= to Rs.300/=. This is used for long period of storage. In this structure colour of the grain stored will be improved, but viability will be lost because of high temperature gradiant. This is insect proof (Fig.17).

Vadevu: This is similar to that of Hagevu. The walls are made of brick with mud plastering of granite stones slabs. Top is covered by granite stone slabs with a manhole of 2'x2'. Here also removal of grain is difficult. Capacity ranges from 20 to 40 quintals. Approximate cost is about Rs.1000/=. The structure is of rectangular cross section. This is also used for long period of storing (Fig.18).

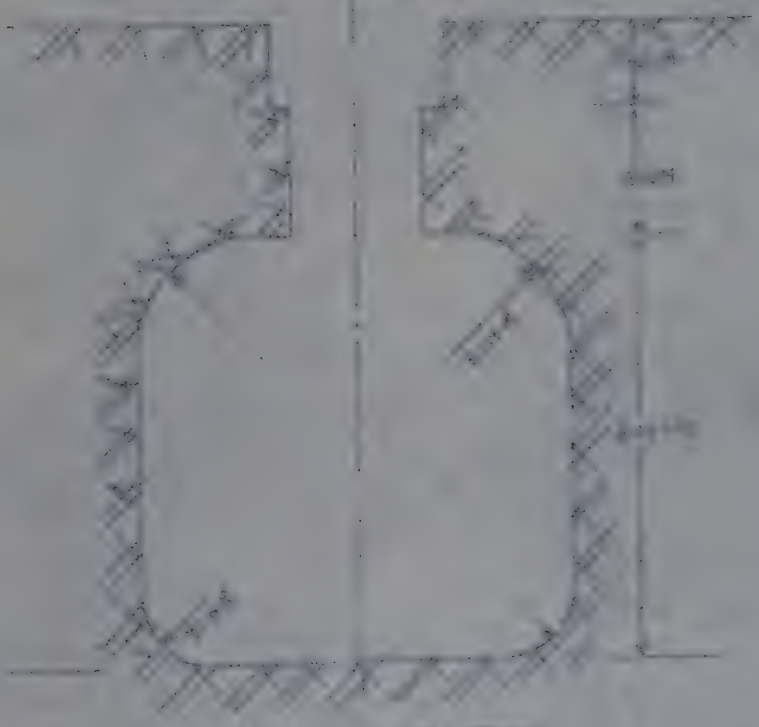
This survey indicates that most of the structures used are not safe against dampness, rodents and insects. So, methods are to be developed to improve the existing storage practices.

During the survey on storage structures it was noticed that the main pest involved is Rice weevil (Sitophilus oryzae) which appears in early stages of storage. In few cases Angoumois grain moth (Sitotroga cerealella) was also noticed in early stages of storage. In the later stages i.e., after 5-6 months of storage the lesser grain borer (Rhizopertha dominica) is found to infest heavily. In Hagevu it was found that the lesser grain borer is not infesting.

It was also observed that majority of the farmers do not take either prophylactic or curative

SCALE 1MM = 40 M

PLAN



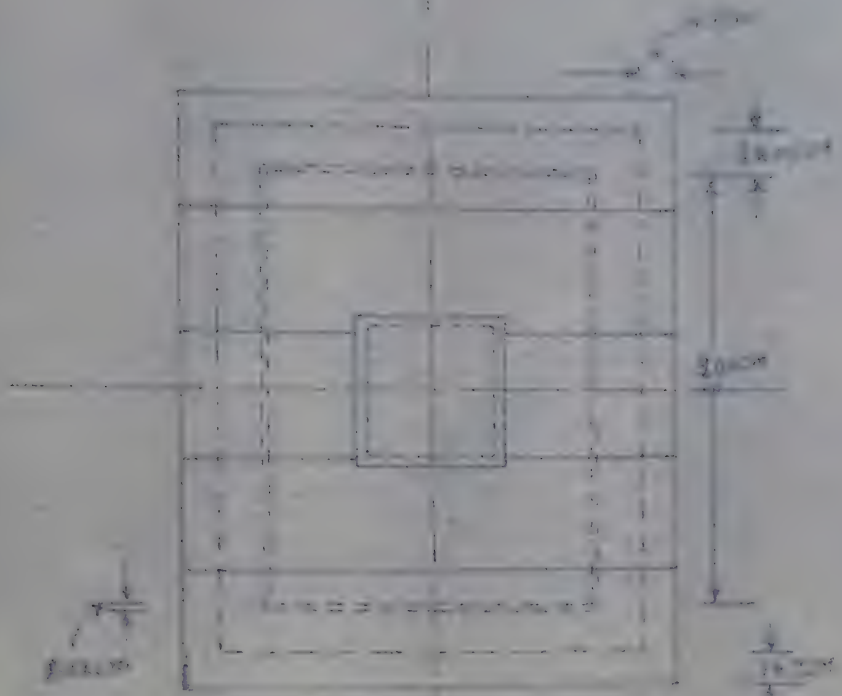
SECTIONAL ELEVATION

HAGEVU

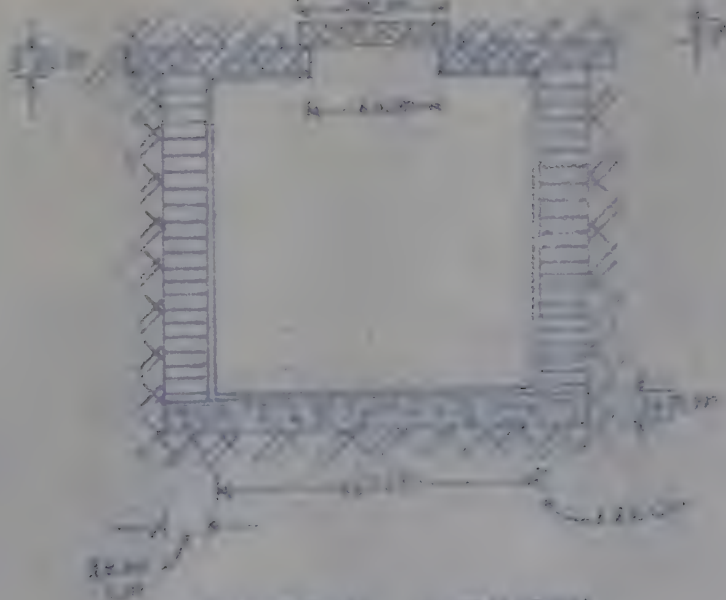
Fig No 17

PROJECT	
A.E.I. U.A.S. ZARIA	
DRW	
APD	

SCALE 1MM = 4CM



PLAN



SECTIONAL ELEVATION

VADEVU

Fig No 18

H.P.H.T. SCHEME
A.E.I. U.A.S. RAICHUR
DRN
APD

measures. Few farmers were found to adopt dusting with D.D.T. 5% dust or B.H.C. 10% dust on bags. In some taluks, though Ethylene Di-Bromide (E.D.B) ampoules were supplied free of cost to farmers from Department of Agriculture, Karnataka for fumigating the grain. Most of the farmers were ignorant about the use of the same.

It can be inferred by survey that gunney bags and room storage formed gmain storage structures in all taluks of Raichur district.

In Manvi, Sindhanur, Gangavathi and Koppal taluks, puri structures made by paddy straw is used for storing paddy.

Raichur, Lingasugur, Koppal and Deodurg which is a dry tract, Hagevu and Vadevu underground structures are being used.

Ponaka, ghadi, galga and earthern pots were used to store small quantity of grain in Sindhanur, Gangavathi and Koppal taluks. In this area, use of metal bins is not common. In few cases grain is stored in bulk in a portion of a hall in the house.

During survey, the farmers were educated on the proper storage methods. The need for thorough drying,

cleaning and prophylactic spraying of store room and receptacles with safe chemicals like Malathion etc., and use of certain fumigants like EDB, aluminium phosphide etc., to control the existing infestation were clearly explained to them and the farmers evinced keen interest. However, the need for demonstrations on the spot to the farmers in an intensive and extensive manner for proper storage is strongly felt. This type of extension work to a limited extent should be entrusted to extension education units of Agricultural Universities, National Demonstration Units and to the field staff of Department of Agriculture. Due to better performance of the metal bins, Government of Karnataka has lanched a scheme under 'SAVE GRAIN' Campaign and supplied metal bins of half and one ton capacity to the farmers at subsidised rates.

nvs/

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TECHNICAL PROGRAMME 1972-73

The technical programme for the year 1972-73 was assigned to this centre in the first annual workshop of the HPHT Scheme held at the Indian National Academy of Science, New Delhi on December 19, 1972.

Project Number	I.C.A.R. Code No.	Project Title
1	$T_2/72$	Comparative studies of various fuels, electricity, solar energy and agricultural waste for drying.
2	$T_3/72$	Determination of optimum harvesting date and moisture level for sorghum.
3	$T_8/72$	Testing and evaluation of different types of storage bins for their relative performance.
4	$T_{13}/72$	Effect of various agronomical inputs and treatments on the quality of grain and post-harvest operations.
5	G14-A/72	Pre-harvest chemical treatment to control storage grain pests of sorghum.
6	G14-B/72	Estimation of storage losses of sorghum grain due to insect pests.

APPENDIX-II

TECHNICAL PROGRAMME 1973-74

The technical programme for the year 1973-74 was assigned to this centre in the second annual workers meeting of the HPHT Scheme held at G.B. Panth University of Agriculture and Technology, Panthnagar on December 20, 1973.

Project Number	I.C.A.R. Code No.	Project Title
7	$T_4/73$	Development of less expensive cleaners for sorghum and groundnut.
8	$T_6/73$	Modernisation of grain markets.
9	$T_7/73$	Examination of existing storage practices in Karnataka State for their improvements.

nvs/